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TEWG MINORITY REPORT REGARDING INTERIM STRANDING LIMITS FOR LOGGERHEAD AND KEMP'S RIDLEY SEA TURTLES IN 1998

By

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INTRODUCTION

We, the Turtle Expert Working Group (TEWG) Minority, do not concur with the TEWG Majority's application of a Potential Biological Removal (PBR; a concept applied to marine mammals) approach to estimating stranding limits for adult (>=92 cm SCL) loggerheads. We stipulate that the TEWG previously agreed to consider a PBR, or PBR-like, approach to estimating Total Allowable Take for sea turtles. However, such consideration was predicated on completion of a workshop of PBR experts and population modelers, the goals of which were to fully explore the applicability of PBR and other modeling methods to sea turtles, and to provide a report of the findings to the TEWG. Because this workshop has not taken place and no report has been submitted, there is no foundation for use of PBR for sea turtles, so we are opposed to the TEWG's application of any PBR technique to any species or life stage of sea turtles. Without a better understanding of whether PBR is appropriate for sea turtles or how PBR behaves under various scenarios and estimates of minimum population level ($\mathbf{N}_{Min}$) and maximum intrinsic rate of population increase ($\mathbf{r}_{Max}$), we believe the use of PBR is extremely risky from a scientific point of view. We also question whether the conservation factor (0.5) for threatened species of marine mammals is appropriate when applied to sea turtles. Adequate discussions of these concerns also have not yet taken place, and until they do, following the appropriate workshop, we are opposed to the TEWG's use of a PBR approach for any life stage or species of sea turtle.

In addition to objections raised in the previous paragraph, in our opinion the biggest problem with the PBR approach is the necessity to relate calculated PBRs to sea turtle strandings. Calculated PBRs are supposed to represent Total Allowable Take (TAT) by all human endeavors, including but not limited to incidental capture by fisheries, but strandings represent only some unknown proportion of this TAT, and also include natural mortalities. To our knowledge, the proportionate relationship between sea turtle TAT and strandings has not been accurately estimated, nor has its temporal-spatial variability. Whatever proportion is used to represent the relationship between strandings and TAT, or to estimate allowable strandings from TAT, will be highly questionable and unsupported by credible scientific evidence or literature at this time.

In 1996, it was our understanding (and that of the entire TEWG) that Interim Stranding Limits (ISLs) for loggerheads and Kemp's ridleys would be estimated only for 1996, providing time to develop the PBR and modeling workshop and alternative approaches. However, the ISL estimation methods used in 1996 were modified for estimating ISLs in 1997. Now the TEWG is estimating ISLs for 1998, using further modifications of the methods. We are concerned that the TEWG continues to modify and develop methods for estimating ISLs in lieu of pursuing its original plan of convening a PBR and modeling workshop. We also are concerned that the methods continue to change, based on theory and supposition, under the assumption that the modified methods are more risk-averse and conservative than their predecessors, but without adequate supporting evidence or analysis. Nevertheless, we agree that, in the absence of the workshop and its report, a strandings-based approach remains the best available interim approach.

RECOMMENDED APPROACH AND RATIONALE

The approach we propose for estimating loggerhead ISLs on a region-specific basis for 1998 uses the entire time series of best available strandings data (1986 through 1997). The strandings data from these years are based on reasonably uniform coverage of strandings along the Gulf and Eastern U.S. coastlines. The regions are as defined by TEWG (1998; in Table 4, p. 75); i.e., Western Gulf of Mexico, Eastern Gulf of Mexico, Southeast U.S. Atlantic and Northeast U.S. Atlantic. In our approach, the arithmetic mean of strandings (excluding cold-stunned, TED-test, captive-reared and post-hatchling loggerheads) is calculated for each region along with its standard deviation (SD), which are the appropriate statistics used in combination for comparison of a point estimate to the historical average (mean for 1986 to 1997), at the 95% level of confidence. If management wishes to ensure that the ISL does not increase as compared to the historical mean strandings level, the appropriate estimate of ISL should be equal to the mean + 2 SDs. To be more conservative, the mean + 1 SD should be used. These formulations are appropriate for stocks that exhibit stability. If a stock is not at an acceptable level and is not showing a trend of increase, ISLs should be reduced significantly, under the assumption that they are indices of Total Allowable Take. If a stock is decreasing, an even more conservative approach is required; i.e., ISL should be set as the mean - 2 SDs.

Using a region-based approach allows flexibility for setting more stringent limits where strandings in a given region or regions may be high, or the nesting population may be declining. In contrast, more lenient limits can be set in regions where reducing strandings would have a minimal impact on regional populations.

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The TEWG (1998) has elected to divide the Western North Atlantic loggerhead population into subpopulations, recommending that they be treated as separate management units. These units include the South Florida nesting population (approximately 64,000 nests per year), Northern nesting subpopulation (6,200 nests per year), the Yucatan nesting subpopulation

(1,500-2,300 nests per year), and the Florida Panhandle nesting subpopulation (450 nests per year). The South Florida nesting subpopulation appears to be increasing at a moderate rate, the Northern nesting subpopulation appears to be stable or decreasing, and the two smaller nesting subpopulations show no significant trends, with the overall stock showing stability or slight increase.

Average loggerhead strandings are markedly higher in the Southeast Atlantic Region than elsewhere, and lowest in the Western Gulf of Mexico (Table 1). By far, the highest shrimp fishing effort occurs in the Western Gulf of Mexico, followed by the Southeast Atlantic and Eastern Gulf of Mexico. Strandings along the U.S. Eastern seaboard are dominated by a mixture of South Florida and Northern nesting subpopulations (with the latter becoming more prevalent Northward), and loggerheads from foreign waters. The genetic identity of loggerheads stranded in the Gulf of Mexico remains unknown.

Table 1. Arithmetic mean (for years 1986-1997), standard deviation (1 SD and 2 SDs), and proposed Interim Stranding Limits (ISLs) for loggerhead sea turtles in 1998, by region, under two management options.

				ISLs by Management Options	
Region*	Mean (1986-1997)	1 SD	2 SDs	Multiple Subpop'ns	Single Pop'n
NEUS Atlantic	191.4	60.8	121.6	70**	252***
SEUS Atlantic	877.4	192.6	385.2	492**	1,070***
Eastern GOM	168.5	56.2	112.4	225***	225***
Western GOM	136.2	49.2	98.4	185***	185***
Sums	1,373.5			972	1,732

* See TEWG (1998) for geographic delineation of each region.
** Mean - 2 SD
*** Mean + 1 SD

INTERIM STRANDING LIMIT RECOMMENDATIONS FOR LOGGERHEADS IN 1998

If NMFS chooses to adopt a multiple subpopulation approach designed to recover the Northern nesting subpopulation, loggerhead mortality (as indexed by strandings) along the entire East coast must be significantly reduced. Therefore, we recommend that ISLs be calculated by subtracting 2 SDs from the means for both the Northeast U.S. Atlantic and Southeast U.S. Atlantic regions (Table 1). Strandings in the low abundance areas in the Gulf of Mexico should not be allowed to increase; i.e., the ISLs for the Western and Eastern Gulf of Mexico should be calculated as the mean plus 1 SD. Overall, this leads to a sum of regional ISLs of 972 loggerheads; 185 for the Western Gulf of Mexico, 225 for the Eastern Gulf of Mexico, 492 for the Southeast U.S. Atlantic and 70 for the Northeast U.S. Atlantic. The sum of loggerhead regional means (1,374), is 141% higher than the sum of ISLs (972).

Under a multiple subpopulation approach, the largest reductions in regional mean strandings, based on the proposed ISLs, would be allocated to the Northeast U.S. Atlantic region (63% reduction) and Southeast U.S. Atlantic region (44% reduction) where strandings contain the most representatives from the Northern subpopulation. Since other fisheries as well as the shrimp fishery are implicated in the Atlantic seaboard strandings (especially in the Northeast U.S. Atlantic Region), NMFS should convene a Take Reduction Team to develop approaches to reduce loggerhead take and strandings to assure recovery of all loggerhead subpopulations in the U.S.

An alternative management option would be to treat U.S. loggerheads as a single stock or population (Table 1). The assessment would be that the overall population level is relatively high, and stable. In this case, the sum of the regional ISLs (1,732 turtles) would be the appropriate population ISL. This compares to the sum of the regional means of 1,374, which is 21% smaller.

Thus our recommended total ISL for loggerheads in 1998, the sum of ISLs set on a regional basis, would be 972 or 1,732, depending on management by region versus management by overall population. This gives management the flexibility to take regional factors into account as well as socio-economic factors not addressed by the TEWG.

INTERIM STRANDING LIMIT FOR KEMP'S RIDLEYS IN 1998

In 1998, the TEWG agreed to use linear regressions of a Kemp's ridley population index (annual hatchling production at Rancho Nuevo and North and South Camps, with a 2 year time lag; i.e., for years 1984-1995) and strandings for years 1986-1997 to set the ISL for Kemp's ridley. This was based on the working hypothesis that the Kemp's ridley population will not continue to increase if the rate of increase in strandings (positive slope of the strandings trend) exceeds the rate of increase in the population index (positive slope of the population index trend), under an assumption that strandings represent a constant proportion of total annual mortality. In the Majority Report, the strandings data excluded cold-stunned, head-started, captive-reared and post-hatchling Kemp's ridleys. Also in the Majority Report, the Kemp's ridley ISL for 1998 was represented by a data point added to the 1986-1997 time series, such that the slope of the 1986-1997 strandings regression was 1 standard error (SE of the slope) lower than the slope of population index regression. During the March 1998 TEWG meeting, the slope for the strandings trend for 1986-1997 was found to be close to 1 SE lower than the slope for the population index trend, so the estimated ISL (482 strandings) was very close to the value that would have been obtained by merely extrapolating the 1986-1997 strandings regression an additional year. As far as the Minority is concerned, we agreed to an ISL of 482 Kemp's ridleys for 1998, under the assumption that our concerns about the method would be adequately addressed before this method was proposed for additional use. However, when a new set of data was distributed to TEWG members after the meeting, and the ISL was recalculated, the estimated ISL for 1998 dropped to 334 strandings, ostensibly due to the exclusion of cold-stunned animals. Therefore, we in the Minority do not feel bound by any agreement concerning the new method, since the data and calculated ISL upon which the agreement was based were altered after the meeting.

Whether or not cold-stunned animals should be included in estimating ISLs can be argued. If the intent is to exclude all strandings attributable to natural causes, this would require a determination of the cause of each stranding. Note codes in the stranding records are ambiguous in some cases. It is well recognized that an accurate cause of death cannot be determined for every stranding, even upon thorough examination and necropsy by a veterinary pathologist. In any case, if any strandings suspected of being due to natural causes are eliminated from the calculations of ISLs, such strandings should also be eliminated from the cumulative counts of strandings which are reported by NMFS and compared monthly to the estimated ISLs. To exclude strandings representing only one natural cause of mortality is inconsistent and arbitrary. However, if the Kemp's ridley ISL presented in the Majority Report is accepted for 1998, no cold-stunned strandings should be included in the annual cumulative strandings reported monthly by NMFS for comparison with the ISL.

We strongly recommend that the issue surrounding the exclusion of naturally caused strandings and the statistical properties of the new ISL estimation method be fully examined before this method is considered for further possible application. Our specific concerns with this method are:

1. Tests should be performed to determine if the regression slopes for either the population index or strandings differ significantly from zero, and it must be explicitly stated what will be done if one or both slopes do not differ significantly from zero.

2. If one or both slopes differ significantly from zero, a test should be performed to determine if the slopes differ significantly from each other, and it must be explicitly stated what will be done if the slopes do not differ significantly. In the specific application of the method to estimate the 1998 ISL, the variances of residuals differed significantly between the two regressions, thus making the test between slopes insensitive, but in our opinion not invalid.

3. There has been no examination of the statistical properties of the new method by which one point (one year beyond the data used to fit the strandings trend) is added to the strandings time-series to reduce the slope of the strandings trend to a value equal to 1 SE lower than the slope of the population index trend.

4. Theoretically, if the population index and strandings trends did not differ

significantly, the strandings trend were very tight-fitting, and the slope of the strandings trend were adjusted to 1 SE lower than the slope for the population index trend, the value added to adjust the strandings trend downward (i.e., another point representing the ISL) would have to be much lower to force such a change in slope. This might represent unnecessary overcorrecting. Using a single point to bring down the slope of the strandings trend may be giving too much weight to a single value. Also, if the strandings slope did not exceed that of the population index trend, there would be no reason to adjust the slope of the strandings trend (i.e., the population should continue increasing at its current trend).

5. There is no established biological basis for the assumption by the Majority that the slope of the strandings trend should be at least 1 SE lower than the slope of the population index trend. The fact that the two trends parallel each other (the slopes cannot be distinguished, significantly, from each other) suggests they could both be tracking the true population trend, but this is not certain. There is a chance that neither are tracking the true population trend. Furthermore, if the slopes were significantly different, this could suggest the two indices have different reliability in tracking population trends. We have no means of testing which index provides the best estimate of the true population trend, nor do we have any scientific basis to argue that one slope should be higher or lower than the other, if the population is to continue to recover and the existence of the species is not placed in jeopardy.

   The Majority-assumed requirement that strandings not increase at a rate faster than that of the population index implies that there is a cause-effect relationship between strandings and future population levels; i.e., that a higher rate of increase in strandings will, at some time in the future, cause a reduction in the rate of population increase, thus inhibiting recovery or threatening the existence of the species. While such an assumption seems intuitive, in fact the fluctuations in strandings have not been linked to future fluctuations in population. Similarly, current fluctuations in the population index have not been linked to past levels of strandings. Thus, strandings have not been shown to be good predictors of future changes in population indices, with or without time-lags of various duration. The population index itself (hatchling production with a 2-year time-lag) represents only a small fraction of the total population of Kemp's ridleys in any given year. Fluctuations and trends in strandings may reflect fluctuations in fishing and natural mortality as well as fluctuations and trends in the true population.

   The ISL estimation method used in 1998 might represent an over-correction, when none was needed. We have observed large fluctuations in strandings with no corresponding change in the population index trend. This could suggest that instantaneous total mortality rates may not be as high as assumed by the TEWG, or that strandings are poor predictors of mortality.

LITERATURE CITED

Turtle Expert Working Group. 1998. An Assessment of the Kemp's Ridley (*Lepidochelys kempii*) and Loggerhead (*Caretta caretta*) Sea Turtle Populations in the Western North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-409, 96 p.